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ABSTRACT

This paper reviews some of the strategies the receiver uses in the process of comprehending a message in a foreign language and discusses some of the ways in which the listener/reader goes beyond the actual physical form of the message during this process. The role of guessing is discussed in the context of the following theories: the signal-detection theory, information theory, an analysis-by-synthesis theory of perception and linguistic theory. The signal-detection theory implies that a process of decision-making is involved in comprehension. Information theory yields a definition of information as "the reduction of uncertainty." An analysis-by-synthesis theory of perception attributes to the perceiver an ability to predict and check "what goes with what." Finally, experiments in linguistic theory show that recall of sentences is meaning-preserving. Of particular interest is the work of Bever in listening and Schlesinger in the reading process. Their studies focus attention on anticipation as a strategy for comprehension, a finding consistent with an analysis-by-synthesis theory of perception. Although most experimental work has concentrated on the perceiver's ability to decode or anticipate the signal, many studies demonstrate the subjects' capacity to compound information which can be inferred from the information they are given. In conclusion, the implications of this discussion for the language teaching situation are indicated. (Author/AMH)

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GOING BEYOND THE SIGNAL : STRATEGIES IN COMPREHENSION

It can be argued that the most important skills to be acquired by Australian students learning languages such as French, which are not widely spoken by minority groups within our community, are the comprehension skills of listening and reading. Opportunities for speaking the language are limited, mainly to the occasional overseas trip; opportunities for writing it are more limited still. Yet, wherever one lives, one can keep in contact with French life and thought through its books, newspapers and journals and through French films, records and radio broadcasts.

It is for this reason that I have chosen to speak on comprehension skills. I want to look at some of the strategies the receiver uses in the process of comprehending a message and I hope to show some ways in which the listener/reader goes beyond the actual physical form of the message during this process.

Listening and reading can be viewed in three distinct but interrelated ways: as acts of communication, as language acts, and as acts of perception. I will draw upon some theoretical concepts and some empirical evidence from these three areas.

Information theory provides us with a useful working definition of the concept of information. It is understood as the reduction of uncertainty, and uncertainty is computed in terms of the number of alternatives among which the receiver has to choose. The greater the number of possible choices involved for the receiver, the greater the amount of information a message is deemed to contain. This concept has direct application to a study of listening and reading: these are both processes of acquiring information and we can relate the amount of information (in the technical sense) contained in a message to the fluency with which the individual is able to comprehend the language. The fluent person knows what to attend to and what to ignore, just as the experienced reader faced with a document presented in highly decorated script knows what is essential and what is mere embellishment, while the novice, in both cases, labours painstakingly to decipher each individual sign. The fluent listener and reader is also able to make informed guesses about what is to follow, on the basis of his general knowledge of the language; a good knowledge of the subject matter will, of course, make his guess even more reliable.

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Guessing as a factor in acquiring information is dealt with in a branch of communication theory known as "signal detection theory", evolved by Swets, Tanner and others as a means of analysing and computing the decision-making process [Swets, Tanner and Birdsall, 1964].

In one of the commonest experimental detection problems, the observer has to specify in which of a given number of cases he believes a signal occurred. According to the theory, his decision will depend upon whether or not the observation exceeds a given critical level or criterion. The criterion, in turn, varies according to the observer's attitude towards the detection situation and the information he has about the relevant parameters of the situation.

The theory, then, carries with it a refutation of the concept of a threshold or cut-off point for response. It is not the case that we hear or do not hear a word; what is involved is a process of decision-making

whose efficiency can be shown to be related to the willingness of the listener to make a response (the costs and values of response, to use Swets and Tanner's terminology) and what he knows of the probability of occurrence of the word. The theory places great emphasis on the occurrence of false detections (errors) which are seen as reflecting essential features of the process, since the more probable a signal is, the more likely are detections, both true and false. Furthermore, to use again the notion of costs and values, the greater the gain from correct detections compared with the loss from false ones, the more detections occur.

I have said that the information the perceiver has about the relevant parameters of the situation helps him to establish his criterion. What are those parameters which, from the point of view of the listener/reader, increase the probability of the occurrence of a given word ?

Experimental evidence has shown that all of the following factors may be involved:

context - Broadbent [1968] found that subjects listening over a noisy telephone channel understood words in isolation. The presence of the earlier words in the sentence may be regarded as changing the size of the ensemble from which succeeding words are chosen.

prior set - different sets of subjects heard the same sentences in the presence of noise on five occasions. Their ability to interpret the sentence was found to be directly related to the extent to which the topic has been previously indicated [Bruce, 1958].

knowledge of linguistic, cultural, psychological probabilities - Spolsky [1968] has been able to distinguish experimentally between native speakers and highly proficient non-native speakers by presenting each group with examples of artificially mutilated speech. Native speakers regularly perform better in these experiments, because, Spolsky suggests, they are aware of the sequential probabilities of sounds, letters and words (linguistic data); they are aware of what it is appropriate to say in a given situation (cultural data); or what a native speaker is likely to think or say in a given situation (psychological data). They don't need as much precise information as the non-native speaker in order to make an accurate guess.

Comparable evidence was obtained for reading by Oller and Tullius [1973] who tested, by means of eye-movement photography, the reading activity of native and proficient non-native subjects. Studies of eye-movements have revealed that, in reading, the eye moves across the page in a jerky fashion, making occasional pauses or fixations (at which point the data are analysed) and sweeping back and regressing, when the material has not been understood. While there was no difference in the efficiency of reading (measured by the number of regressions made per unit of reading time) between the two groups in this experiment, the average duration of fixations for all non-native groups was consistently longer than that of native speakers. Since, as I have said, this is the point at which the actual decoding takes place, i.e. the information is analysed structurally and semantically, one can assume that the non-native speaker experiences greater uncertainty in the areas suggested by Spolsky, and takes longer to process the material.

The listener/reader, then, makes active use of information outside the message itself to aid in its comprehension. The more information he possesses, the more effective and more speedy will be the comprehension.

It is even possible for the subject to override certain features of the signal if these features conflict with his general perception of its structure of meaning. I am referring here to the "click" experiments conducted by Bever and his associates Bever, [1970]. Bever's hypothesis was that in the comprehension of speech we segment the linguistic material into deep structure units, and these units hold together, resisting interruption.

In the experiments, the subjects listened to a sentence during which a click occurred, and they were required immediately afterwards to write the sentence and indicate where the click occurred. The experimenters predicted that subjects would tend to hear the click as coming between structural units (i.e. phrases) even when, objectively, it did not, and their prediction was born out. To avoid the possible facilitating effect of intonation and pausing, Abrams and Bever [1969] constructed sentences artificially by splicing words together from a random list. Results remained the same. Similarly, sentences containing embedded clauses produced the same effect as those with sequentially placed clauses. In "The man who nobody likes is leaving soon", the extremes of the embedded clause attracted the subjective location of the click. Schlesinger [1968] made comparable findings in relation to the reading process. He too worked from the hypothesis that the reader organises data into deep structure units. Eye movement photography has shown that when a subject is reading aloud he pronounces a given word while his eyes move several words ahead. Schlesinger turned off the light after subjects had read a given number of words, and asked them to name the words which followed. It was found that subjects always responded in terms of a complete syntactic constituent, or in TG terms, a deep structure unit.

In some later experiments on the same theme, Bever took his hypothesis a step further and postulated that subjects show an awareness of *possible* surface/deep structure relationships rather than the actual relations involved in the sentence being processed.

For example, when presented with the pair of sentences:

The general desired soldiers to fight.
The general defied soldiers to fight.

Subjects tended to locate the click after *desired* far more often than after *defied* because, in Bever's terms, they "know" that after *defy* direct object must follow, while in the case of *desire* it is possible to have a noun-phrase following, and this would represent a separate deep structure unit.

Whether it is the syntactic structure the subject is responding to or the meaning encoded in that structure is still a matter of some debate. Sachs [1967] has shown that minor elements in the surface form of the signal will have varying effects, depending on the role they play in the communication of meaning. She tested subjects' ability to recognise sentences on a second hearing after varying delay intervals. There was a high level of detection of the difference between the following two sentences: *There he met an archaeologist, Howard Carter, who urged him to join in the search for the tomb of King Tut;* and *There he met an archaeologist, Howard Carter, and urged him to join in the search for the tomb of King Tut.* On the other hand, an apparently equally minor surface-feature change, which does not affect the meaning, was almost never detected: *There he met an archaeologist, Howard Carter who urged that he join in the search for the tomb of King Tut.*

Here again, we see the receiver actively reconstructing the message, attending only to those elements which fit into the pattern he is imposing on the date.

Bever's later work and Schlesinger's focus our attention on anticipation as a strategy for comprehension: the reader's eye moves ahead of what is actually being read; the listener makes a prediction about what is to follow in the perception of a message. This is consistent with an analysis-by-synthesis theory of perception according to which the perceiver is engaged in constructing a constantly developing model which he matches against input at each new point of fixation. Lashley [1951] was one of the first people to draw attention to the way in which, during listening, the mind anticipates what is to follow. In an address to an audience of psychologists he introduced at an early stage the expression "Rapid writing" (in reference to the use of a typewriter). He later read the sentence "Rapid righting with his uninjured hand saved from loss the contents of the capsized canoe". The shock experienced by his audience on hearing the "capsized" stems from the fact that it was outside the set of words which they were predicting on the basis of the earlier interpretation.

Clay and Imlach [1971] showed the anticipatory function at work in the reading behaviour of young children. They analysed the oral reading behaviour of seven-year olds in terms of the suprasegmental variables of juncture, pitch and stress. They found that while the best readers used a falling intonation at the end of a sentence, poor readers were more likely to use a rising or sustained pitch "implying uncertainty". The good readers can control the intonation contours of their reading because they are looking ahead, anticipating what is to follow. The poor readers were not prepared for a sentence completion when it came, hence the accent of uncertainty or even surprise.

I have been stressing so far some ways in which the perceiver goes beyond the physical form of the signal in the process of comprehension. There is another respect in which he can be said to go beyond the signal. By the use of inferencing, he gains more information from a message than is contained in the literal meaning of the words.

Fillenbaum [1973] quotes a series of experiments which demonstrate subjects' capacity to compound information which is entailed by what they have previously heard or which is presupposed by the information they are given. To give an example of entailment: subjects hear sentences like "John is tall. John is shorter than Bill" from which it may be inferred that "Bill is tall". The sentence "Bill is tall" will be more often recognised at a later hearing as having been part of the set than in cases where the original pair of sentences was "John is tall. John is taller than Bill" which does not necessarily entail "Bill is tall".

In an experiment designed to test subjects' capacity to recognise what is presupposed by a given sentence, Fillenbaum [1974] used conditionals of the type: "If he had caught the plane, he would have arrived on time". This sentence presupposes "He didn't catch the plane", and if it doesn't presuppose. at least strongly suggests "He didn't arrive on time". On a later test, subjects showed a significantly higher recognition rate for those negatives implied by the original conditionals than for those that were not.

The material I have presented here has direct implications for the language teaching situation. We have seen that guessing is an integral part of the information-receiving process. Guessing carries with it the

risk of error; but error also belongs to the system. Nonetheless, it is common for language learners (and teachers) to fear errors of any kind. Teachers need to create an environment in which the cost of errors is not too high and, at the same time, devise exercises anc activities which will develop the students' capacity to guess appropriately from minimal clues.

Context, prior set, knowledge of sequential probabilities of the language, cultural awareness - all of these are factors which reduce uncertainty about the message and can be exploited in the teaching of comprehension. It is a question of balance, of limiting the number of choices for the perceiver: if the language is difficult, the context will need to be more thoroughly filled in, and so on.

It has been suggested that in the perception of language, we organise data on the basis of deep structure units. Early listening and reading material could be presented in structurally segmented form with pauses built in, in the case of listening, to allow the student time to process the material. Later exercises will focus on the recognition and reconstruction of deep structure units.

The anticipatory function can be developed by the use of sentence completion exercises, cloze tests, dictées à trous and the reordering of scrambled sentences.

Finally, it needs to be borne in mind that comprehension involves more than mere literal understanding; it goes beyond anything that a linguistic analysis of the actual sentences can supply. The development of this skill will be an important goal of the teaching of comprehension.

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